

**AR18**

# Annual Report 1970

Northern Electric Company, Limited







# Northern Electric Company, Limited

Montreal, Canada

Directors and Officers	2	<i>Si vous désirez une version française de ce rapport, veuillez en faire la demande au service des relations publiques de la Compagnie Northern Electric, Limitée, case postale 6123, Montréal, Qué.</i>
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# Northern Electric Company, Limited

## Directors

G. Maxwell Bell  
Chairman of the Board  
F.P. Publications Ltd.

Georges L. Demers, Q.C.  
President  
Sterling Securities Corporation

A. Jean de Grandpré, Q.C.  
Executive Vice-President  
Eastern Region  
Bell Canada

\*Arnold J. Groleau  
Executive Vice-President  
Administration  
Bell Canada

Herbert H. Lank  
Director  
Du Pont of Canada Limited

Alexander G. Lester  
Consultant

\*Vernon O. Marquez

J. Angus Ogilvy, Q.C.  
Senior Partner  
Ogilvy, Cope, Porteous, Hansard,  
Marler, Montgomery & Renault

Charles Perrault  
President  
Conseil du Patronat du Québec

\*Gérard Plourde  
Chairman of the Board  
U.A.P. Inc.

\*Robert C. Scrivener  
President  
Bell Canada

\*Marcel Vincent  
Chairman of the Board  
Bell Canada

\*Edward C. Wood  
Chairman of the Board  
Genstar Limited

*\*Members of the Executive Committee*

## Officers

**Chairman and President**  
Vernon O. Marquez

**Vice-Presidents**  
Wilfred D. E. Anderson  
General Manager, Switching

Charles T. Ball  
Distribution Sales

Quentin R. Ball  
General Manager, Apparatus

Gaston R. Boyer  
Switching — Service and Control

Ewart O. Bridges  
Corporate Planning

Donald A. Chisholm  
Research and Development

John R. Houghton  
Manufacturing and Engineering

Kenneth S. Hoyle  
Technology Planning

J. Bruce Hutchinson  
General Manager, Transmission

W. Ritchie Johnston  
Switching Marketing

André A. Lavallée  
Finance and Treasurer

Raymond C. Smythe  
Personnel

Kenneth H. Woodley  
General Manager, Wire and Cable

**Comptroller**  
W. Leonard Glasspoole

**Secretary and Counsel**  
Joyce A. Borden Reed

# Northern Electric Company, Limited

## Consolidated Results in Brief

	1970	1969
Sales .....	\$563,611,000	\$482,523,000
Net Earnings .....	4,067,000	10,976,000
Net Earnings per Share .....	2.24	6.75
Dividends .....	8,836,000	10,563,000
Dividends per Share .....	4.88	6.50
Capital Expenditures .....	20,924,000	24,239,000
Working Capital .....	181,490,000	147,611,000
Employees (31 December) .....	24,972	26,025



# Report of the Directors to the Shareholders

for the Fifty-seventh Year of Operations Ended 31 December 1970.

Consolidated sales for 1970 were \$563,611,000 compared with \$482,523,000 in 1969 with most of the increased sales coming from export markets. Consolidated net earnings for the period were \$4,067,000 compared with \$10,976,000 in the previous year.

The year 1970 was forecast to be one in which the Company would make significant gains in sales and earnings. The first half of 1970 came close to expectations but the general economic down turn at mid-year reduced the domestic demand for communication products. In addition to this, a five-week strike at the Company's Bramalea switching plant had a severe impact on overall production and earnings. As a result of lower demand, the employee force at year end was 24,972 compared with 26,025 at the beginning of the year.

Although export sales reached record levels, provisions against possible cost over-runs on some continuing off-shore contracts, together with the revaluation of the Canadian dollar, combined to have a negative effect on earnings. Losses in Microsystems International Ltd., the subsidiary formed in 1969, were greater than anticipated, due to the write-off of a short term investment and a worldwide recession in microcircuit markets.

The Company paid a dividend of \$1.62½ per share for each of the first three quarters of the year. Due to decreased earnings in the later months, a fourth quarter dividend was not authorized. Total dividends paid during the year amounted to \$8,836,000 or \$4.88 per share. This dividend payment was less than earnings of \$9,316,000 before providing for the loss in Microsystems International Ltd.

Letters patent were granted in 1969 for the creation of a new jointly owned company to consolidate the research and development efforts of Bell Canada and Northern Electric. The directors of both Companies approved plans for establishing Bell Canada-Northern Electric Research, Limited (Bell-Northern Research) effective 1 January, 1971. Chairman of the Board of Directors is Arnold J. Groleau, Bell Canada Executive Vice-President, and President is Dr. Donald A. Chisholm, formerly Vice-President of Northern Electric.

## Directors and officers

Paul Bienvenu retired from the Board of Directors, in accordance with the retirement rule. He had served for a period of 12 years. The resulting vacancy was filled by election to the Board of A. Jean de Grandpré, Q.C., Executive Vice-President, Bell Canada.

R. Holley Keefler, who had served as President and Chief Executive Officer from 1961 to 1967, and as Chairman of the Board of Directors since 1967, retired from active service after 46 years with the Company and with Bell Canada. Vernon O. Marquez, President of the Company, was appointed Chairman of the Board.

John G. Harper, Secretary of the Company since 1962, retired from active service after 42 years with the Company. Joyce A. Borden Reed was appointed Secretary and Counsel.

Your directors recorded their appreciation of the valuable contribution of the retiring director and officers during their many years with the Company.

André A. Lavallée joined the Company as Vice-President — Finance.



# Employees

The Company is continuing to extend the use of French as the working language in Quebec.

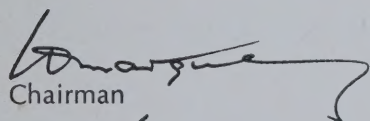
The highest suggestion award in the Company's history, \$5,508, was made to Montreal employee, Charles Proulx, for suggesting an improved method of shipping large cable reels on trucks and trailers.

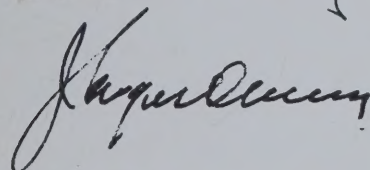
The Directors express their appreciation to the employees for the loyal and efficient contribution they have made to the growth of the Company.

The number of employees decreased during the year to 24,972. Total employment costs were \$231,602,000. Included in this total are the following supplementary employee benefits:

Payments to Pension Trust Fund . . . . .	\$12,504,000
Payments to Government Pension Plans . . . . .	2,231,000
Sickness and Accident Benefits . . . . .	3,073,000
Death Benefits . . . . .	530,000
Disability Pensions . . . . .	58,000

For the Directors,

  
Chairman

  
Director



1. Immediate medical service is available at the plants at all times.
2. Following the presentation by V. O. Marquez, President and Chairman of the Board, of the highest suggestion award in the Company's history, C. Proulx sits in the President's chair.

22 February 1971

# Northern Electric Company, Limited

## Condensed Statement of Earnings

For the year ended 31 December 1970

(Microsystems International Ltd., incorporated in 1969, is shown separately to highlight the effect of its operations on consolidated results for the year. During 1970, this Company continued to experience start-up costs associated with anticipated integrated circuit sales.)

(thousands of dollars)

### **Northern Electric Company, Limited and Subsidiary Companies excluding Microsystems International Ltd.**

Sales .....	\$563,383
Cost of Sales including Selling and General Administrative Expenses .....	517,928
Earnings from Operations before deducting Research and Development Expenses .....	45,455
Research and Development Expenses .....	25,738
	<u>19,717</u>
Interest Charges less Income from Investments .....	4,017
Earnings before Underlisted Items .....	15,700
Provision for Income Taxes .....	6,331
	<u>9,369</u>
Minority Interest in Net Earnings of Subsidiary Company .....	53
Net Earnings for the Year (equivalent to \$5.14 per share) .....	<u>9,316</u>

### **Microsystems International Ltd.**

Net Loss for the Year (excluding Minority Interest) .....	<u>5,249</u>
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<b>Consolidated Earnings for the Year (equivalent to \$2.24 per share)</b> .....	<u><u>\$ 4,067</u></u>
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# Northern Electric Company, Limited

## Consolidated Statement of Earnings

for the year ended 31 December 1970

(with comparative figures for the year ended 31 December 1969)

	1970 (thousands of dollars)	1969 (thousands of dollars)
Sales .....	\$563,611	\$482,523
Cost of Sales including Selling and General Administrative Expenses (Notes 2 and 3) .....	521,518	432,594
Earnings from Operations before deducting Research and Development Expenses .....	42,093	49,929
Research and Development Expenses (Note 4) .....	30,996	25,933
	11,097	23,996
Income from Investments .....	1,562	151
	12,659	24,147
Interest Charges		
Long Term Debt .....	4,313	2,157
Bank and Other .....	792	1,477
	5,105	3,634
Earnings before Underlisted Items .....	7,554	20,513
Provision for Income Taxes (Note 5) .....	5,290	9,845
	2,264	10,668
Minority Interest in Net Loss of Subsidiary Companies before Extraordinary Item .....	2,761	308
Earnings before Extraordinary Item .....	5,025	10,976
Extraordinary Item (Note 6) .....	958	—
Net Earnings for the Year .....	\$ 4,067	\$ 10,976
Net Earnings per Share before Extraordinary Item .....	\$2.77	\$6.75
Net Earnings per Share .....	\$2.24	\$6.75

# Consolidated Balance Sheet as at 31 December 1970

(with comparative figures as at 31 December 1969)

	<b>Assets</b>	
	1970 (thousands of dollars)	1969
<b>Current</b>		
Cash .....	\$ 622	\$ 508
Short Term Investments (Note 6) .....	18,047	—
Accounts Receivable		
Affiliated Companies .....	29,210	29,562
Other .....	62,055	58,010
Property Held for Sale and Lease-Back, at cost .....	9,038	—
Inventories (Note 7) .....	134,428	137,362
Prepaid Expense .....	1,444	1,384
	<u>254,844</u>	<u>226,826</u>
 <b>Investment in Associated Company, at cost</b> (Note 8) .....	 50	 —
 <b>Plant and Equipment</b> (Note 9)		
Land and Buildings .....	51,328	49,852
Machinery and Equipment .....	181,893	165,017
	<u>233,221</u>	<u>214,869</u>
Less: Accumulated Depreciation .....	125,340	115,465
	<u>107,881</u>	<u>99,404</u>
 <b>Deferred Charges</b>		
Unamortized Discount and Expense on Long Term Debt .....	716	—
 <b>Total Assets</b>	 <u><u>\$363,491</u></u>	 <u><u>\$326,230</u></u>

On behalf of the Board of Directors:

V. O. Marquez, Director

J. Angus Ogilvy, Director



# Northern Electric Company, Limited

(Incorporated in 1914 under the Canada Corporations Act)

	<b>Liabilities</b>	
	1970 (thousands of dollars)	1969
<b>Current</b>		
Due to Banks .....	\$ 1,302	\$ 29,035
Accounts Payable and Accrued Liabilities		
Affiliated Companies .....	778	622
Other .....	53,773	39,708
Taxes Payable .....	14,274	7,862
Sinking Fund Deposits due within one year (Note 10) .....	3,227	1,988
	<u>73,354</u>	<u>79,215</u>
 <b>Loan Payable</b> (Note 11) .....	 1,863	 859
<b>Long Term Debt</b> (Note 10) .....	77,050	41,000
<b>Deferred Income Taxes</b> .....	18,814	23,262
<b>Minority Interest in Subsidiary Companies</b> .....	9,419	1,491
	<u>180,500</u>	<u>145,827</u>
 <b>Shareholders' Equity</b>		
<b>Capital Stock</b>		
Authorized — 2,250,000 Shares of no par value		
Issued — 1,812,500 Shares .....	113,975	113,975
<b>Contributed Surplus</b> (Note 12) .....	7,357	—
<b>Retained Earnings</b> .....	61,659	66,428
	<u>182,991</u>	<u>180,403</u>
 <b>Total Liabilities and Shareholders' Equity</b> .....	 <u>\$363,491</u>	 <u>\$326,230</u>

W. L. Glasspoole, C.A., Comptroller

# Northern Electric Company, Limited

## Consolidated Statement of Retained Earnings

for the year ended 31 December 1970

(with comparative figures for the year ended 31 December 1969)

	1970 (thousands of dollars)	1969 (thousands of dollars)
Balance at Beginning of Year as previously reported .....	\$ 66,428	\$ 62,918
Less: Adjustment of Prior Years' Earnings .....	—	1,203
Balance as restated .....	66,428	61,715
Net Earnings for the Year .....	4,067	10,976
Transfer of Reserve for Pensioners' Death Benefits .....	—	4,300
	70,495	76,991
Deduct: Dividends paid .....	8,836	10,563
Balance at End of Year .....	<u>\$ 61,659</u>	<u>\$ 66,428</u>

## Consolidated Statement of Source and Application of Funds

for the year ended 31 December 1970

(with comparative figures for the year ended 31 December 1969)

	1970 (thousands of dollars)	1969 (thousands of dollars)
<b>Source of Funds</b>		
Operations:		
Net Earnings .....	\$ 4,067	\$ 10,976
Add: Charges not requiring an outlay of funds		
Depreciation .....	12,356	10,534
Deferred Income Taxes .....	(4,448)	7,964
Other .....	25	134
	12,000	29,608
Less: Reduction in Deferred Income .....	—	1,478
	12,000	28,130
Loan Payable .....	1,004	859
Proceeds from Issuance of Long Term Debt (Net) .....	39,259	—
Proceeds from Issuance of Capital Stock .....	—	35,000
Contributed Surplus (Note 12) .....	7,357	—
Minority Interest in Subsidiary Companies .....	7,928	401
	<u>\$ 67,548</u>	<u>\$ 64,390</u>
<b>Application of Funds</b>		
Expenditures for Plant and Equipment (Net) .....	\$ 20,833	\$ 23,949
Reduction of Long Term Debt .....	3,950	2,000
Dividends .....	8,836	10,563
Investment in Associated Company (Note 8) .....	50	—
Increase in Working Capital .....	33,879	27,878
	<u>\$ 67,548</u>	<u>\$ 64,390</u>



# Northern Electric Company, Limited

## Notes to the Consolidated Financial Statements

31 December 1970

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### Note 1 Principles of Consolidation

The consolidated financial statements include the accounts of Northern Electric Company, Limited ("Northern Electric") and all subsidiary companies with provision made for the interests of minority shareholders.

Subsidiary companies are:	Ownership
Dominion Sound Equipments Limited ..... Montreal, Canada	100.0%
Industrial Corporation for Telecommunications Equipment S.A. Northern Electric Hellas ..... Athens, Greece	100.0%
Microsystems International Ltd. ("MIL") ..... Montreal, Canada	60.4% *
Northern Electric Caribbean Limited ..... Jamaica	100.0%
Northern Electric Telekomünikasyon A.Ş. .... Umranıye (Istanbul), Republic of Turkey	51.0%
Bell Canada-Northern Electric Research Limited ..... Ottawa, Canada	100.0% **

\* See Note 16

\*\* See Note 18

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### Note 2 Depreciation

Depreciation on plant and equipment amounted to \$12,356,000. Depreciation is calculated on the straight-line method using rates based on the expected useful lives of the assets.

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### Note 3 Remuneration of Directors

Remuneration paid to Directors, including salaries to Directors who are also Company Officers, amounted to \$217,000.

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### Note 4 Research and Development Expenses

Research and development expenses are after deducting the amount claimed for current expenditures under the Industrial Research and Development Incentives Act. Also deducted are Canadian Government conditional grants to MIL amounting to \$6,062,000 (see Note 17).

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### Note 5 Provision for Income Taxes

The net earnings for the year include grants claimed under the Industrial Research and Development Incentives Act for current research and development expenditures which are not subject to income taxes.

Possible future reductions in income taxes relating to losses carried forward in certain subsidiary companies have not been taken up in the accounts as the date of their realization cannot, as yet, be determined.

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### Note 6 Short Term Investments

The short term investments are carried at cost after providing fully as an extraordinary item for an investment held by MIL, as follows:

Provision for loss on a short term investment .....	\$1,586,000
Less: Minority Interest .....	628,000
	<u>\$ 958,000</u>

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**Note 6 Short Term Investments**  
(Continued)

Such provision has been made as it is not possible at present to determine what value, if any, may be placed on this investment. The carrying value of the short term investments approximates market value.

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**Note 7 Inventories**

Inventories are valued at the lower of cost and net realizable value except for copper in raw materials and in work-in-process which is valued on a base-stock method.

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**Note 8 Investment in Associated Company, at cost**

During the year, the Company acquired a 50% interest in Ancom Systems Ltd. This company was established to operate in the field of designing, marketing and installing of satellite communication ground stations.

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**Note 9 Plant and Equipment**

Plant and equipment is stated at cost, which is after deducting amounts claimed for general purpose plant and equipment under the Industrial Research and Development Incentives Act. Also deducted are Canadian Government conditional grants to MIL amounting to \$1,924,000 (see Note 17).

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**Note 10 Long Term Debt**

Sinking Fund Debentures	Authorized and Issued	Redeemed	Outstanding	
			Current Liability	Long Term Debt
4½ % due 1 November 1976 .....	\$20,000,000	\$10,065,000	\$ 935,000	\$ 9,000,000
5½ % 1962 Series due 15 December 1982 .....	20,000,000	4,010,000	990,000	15,000,000
6¼ % Series C due 15 April 1986 .....	15,000,000	648,000	102,000	14,250,000
9½ % Series D due 30 April 1990 .....	40,000,000	—	1,200,000	38,800,000
			<u>\$3,227,000</u>	<u>\$77,050,000</u>

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**Note 11 Loan Payable**

The loan payable represents an interest free loan to MIL from the Canadian Government for the provision of equipment (see Note 17).

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**Note 12 Contributed Surplus**

Contributed surplus represents the gain arising on consolidation from the public issue in 1970 of common shares of MIL.

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**Note 13 Plan for Employees' Pensions**

The latest actuarial valuation of the Plan for Employees' Pensions has established an unfunded liability of \$31,753,000 at 31 December 1969. This amount is being funded by regular payments which will terminate in 1990. Based on this valuation, less payments made to 31 December 1970, the unfunded liability is estimated to be \$29,929,000 at that date. Payments are charged to operations in the years they are made.



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**Note 14 Commitments**

Material contractual obligations in respect of long term leases, principally covering building space, amounted to \$25,111,000 at 31 December 1970. Related rentals incurred for the year 1970 amounted to \$1,455,000 and the minimum amount applicable to the five years subsequent to 31 December 1970 is \$9,689,000 of which \$1,937,000 is applicable to the year 1971.

See Note 16

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**Note 15 Restriction on Payment of Dividends**

Under the terms of the Trust Agreement in respect of the 9½% Sinking Fund Debentures, Series D, due 30 April 1990, Northern Electric undertook not to make any distributions to or for the account of its common shareholders if the aggregate amount of such distributions, subsequent to 31 December 1969, exceeds the aggregate of:

(a) the net earnings of Northern Electric and its subsidiaries other than MIL subsequent to 31 December 1969;

(b) the net proceeds to Northern Electric of the issue of any shares of its capital stock subsequent to 31 December 1969; and

(c) \$10,000,000.

At 31 December 1970, the total amount available for distribution was \$10,480,000.

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**Note 16 Microsystems International Ltd. Issue of Common Shares**

During the period 26 January to 11 March 1970, MIL issued 2,000,000 of its common shares to the public for the sum of \$20,000,000.

Northern Electric has subscribed and agreed to pay for, over a period ending 31 December 1973, an additional 1,950,000 common shares at a price of \$10 per share. As at 31 December 1970, Northern Electric had purchased 450,000 common shares in respect of this subscription. The quoted market price of the MIL common shares at 31 December 1970 was \$5.50 per share.

MIL has issued to Northern Electric, for delivery to the holders of its 4½%, 5½% and 6¼% sinking fund debentures, 430,000 warrants to purchase common shares of MIL at a price of \$13.50 per share until 1 April 1979 on the basis of ten common shares for each \$1,000 principal amount of debentures held. These warrants were issued as a consideration for amendments to the trust agreements to permit long term borrowing by certain subsidiaries.

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**Note 17 Microsystems International Ltd. Canadian Government Grants and Loan**

Under agreements dated 22 July 1969, the Government undertook to reimburse MIL for expenditures approved prior to 1 April 1973 in respect of the cost of specified equipment by means of a conditional grant not exceeding \$12,000,000 and an interest free loan not exceeding \$12,000,000, and also in respect of 50% of certain research and development expenses by means of conditional grants not exceeding \$23,950,000.

To 31 December 1970, \$11,189,000 had been claimed by MIL in respect of the conditional grants. The conditional grants are repayable, without interest, from the cumulative earnings (after deduction of losses) before income taxes, in excess of 10% of the cumulative sales of all products except discrete components.

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**Note 17   Microsystems  
International Ltd.  
Canadian Government Grants  
and Loan**  
(Continued)

The loan (\$1,863,000 at 31 December 1970) is repayable in five equal consecutive annual instalments in respect of each equipment package, the first instalment to be paid one year after the date on which the particular equipment package is put to use.

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**Note 18   Subsequent Events**

In January 1971, the Company subscribed and paid for an additional 99,900 common shares without nominal or par value of the capital stock of Bell Canada-Northern Electric Research Limited at a price of \$1 per share, thereby increasing its investment to 100,000 shares.

Subsequently the Company declared a dividend of 51,000 common shares of its wholly-owned subsidiary, Bell Canada-Northern Electric Research Limited, which reduced its ownership to 49% of the outstanding shares.

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**Auditors' Report**

The Shareholders,  
Northern Electric Company, Limited

We have examined the consolidated balance sheet of Northern Electric Company, Limited and its subsidiaries as at 31 December 1970 and the consolidated statements of earnings, retained earnings and source and application of funds for the year then ended. Our examination included a general review of the accounting procedures and such tests of accounting records and other supporting evidence as we considered

necessary in the circumstances.

In our opinion these consolidated financial statements present fairly the financial position of the companies as at 31 December 1970 and the results of their operations and the source and application of their funds for the year then ended, in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Montreal, Que.  
15 February 1971



Chartered Accountants.



# Northern Electric Company, Limited

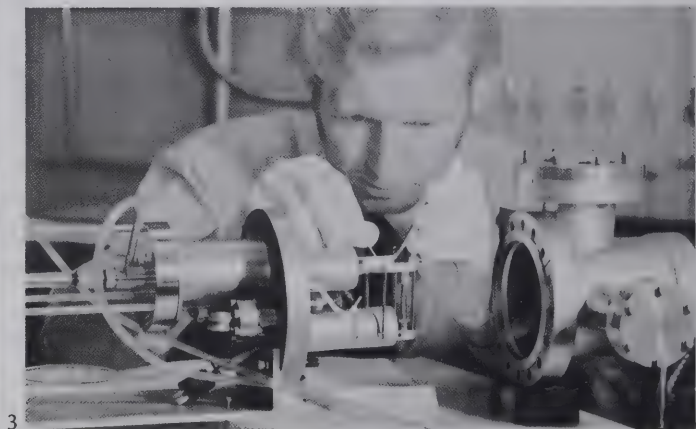
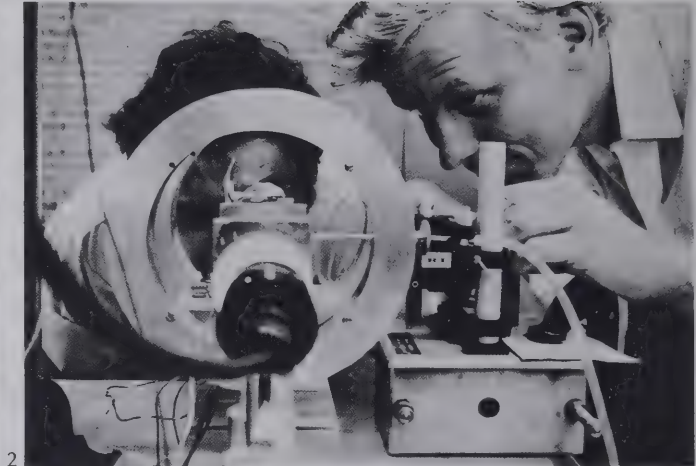
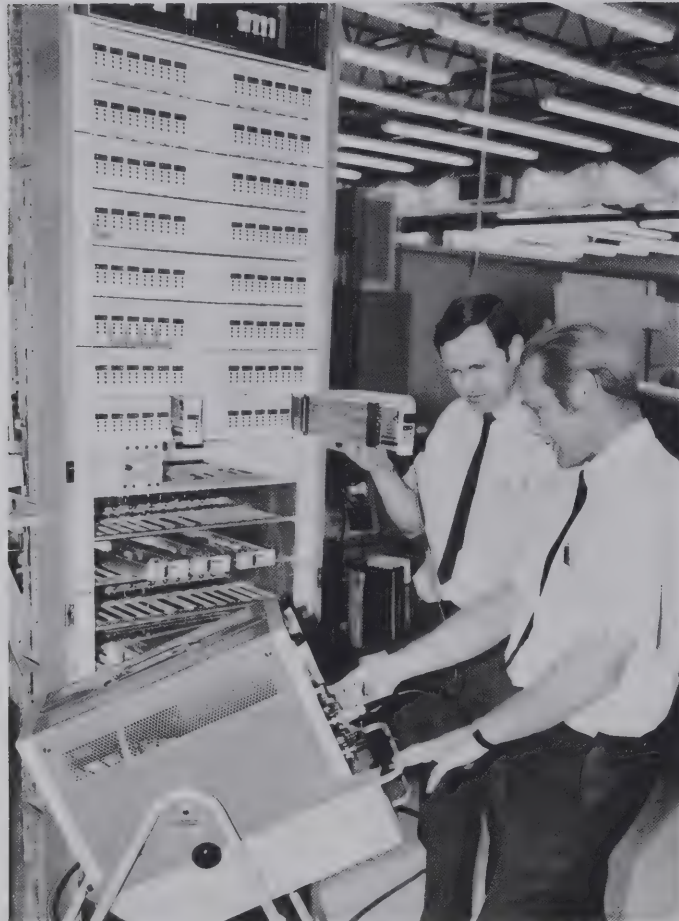
and Subsidiary Companies excluding Microsystems International Ltd.

(Microsystems International Ltd. is excluded in order to provide comparable yearly data. This Company, incorporated in 1969, continued to experience start-up costs associated with anticipated integrated circuit sales.)

## Seven-Year Review

	1970	1969	1968	1967	1966	1965	1964
	(millions of dollars)						
Earnings and Related Data							
Total Sales .....	563.4	482.9	426.3	403.3	400.2	358.1	328.1
Sales of Company Manufactured Products ....	463.7	390.7	345.3	308.1	284.1	249.6	232.3
Depreciation on Plant and Equipment .....	10.9	9.9	9.9	8.6	7.9	6.4	7.4
Interest Charges .....	5.0	3.5	2.7	2.7	2.7	1.9	1.8
Provision for Income Taxes .....	6.3	9.8	5.6	—	.7	2.3	8.8
Net Earnings for the Year .....	9.3	14.1	9.4	2.3	10.1	8.6	9.9
Earnings per Share (Dollars) .....	5.14	8.70	6.42	1.57	9.08	8.46	9.77
Dividends per Share (Dollars) .....	4.88	6.50	6.50	6.50	6.50	6.50	5.65
Financial Position at 31 December							
Working Capital .....	174.1	147.1	119.7	119.3	118.6	93.1	92.5
Plant and Equipment (At Cost) .....	212.1	198.2	194.5	184.6	167.2	146.3	132.4
Accumulated Depreciation .....	120.2	111.7	108.3	100.7	93.9	87.7	82.4
Capital Expenditures .....	16.4	14.7	12.4	19.7	23.0	15.3	12.8
Long Term Debt .....	77.1	41.0	43.0	45.0	47.0	36.2	37.7
Shareholders' Equity .....	184.2	183.6	145.0	140.8	128.6	100.8	95.4
Employment Data							
Total Employment Costs .....	223.3	200.5	175.4	157.1	144.0	119.1	107.2
Employees (31 December) .....	24,009	25,162	23,682	22,557	23,864	19,632	18,066

# Research and Development



In the field of research, work intensified on many promising projects, such as light-emitting diodes for use in key sets and switchboards, magnetic bubbles for information storage, and solid-state crosspoints in switching systems.

The SP-1 electronic switching system with full stored program control underwent a successful field trial and attention is now being concentrated on a 4-wire version for toll switching applications.

In the apparatus field, work on loud-speaking telephones and business communications systems as well as visual and data terminals is in progress.

Major effort was directed to the all-solid-state RA-3 microwave radio transmission family, and to pulse code modulation multiplex equipment for use with the new LD-4 long-haul digital transmission system.

A coaxial cable, developed for carrier applications with the LD-4 system, underwent successful trials.

Preliminary evaluation of aluminum conductor telephone cable under operating conditions was carried out. Also, extensive work was done on a new design for buried cable leading to the potential application of aluminum.

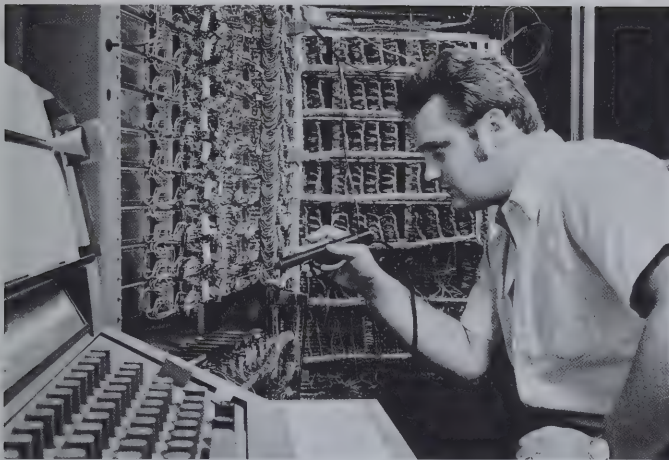
1. Northern's Canadian-developed DE-2 pulse code modulation equipment was designed as the basic building block in voice channel PCM systems. The more efficient PCM technique will largely replace existing modulation techniques for the transmission of voice, data and video signals over a common network.

2. Two researchers experiment with magnetic bubbles, tiny regions of magnetization which show promise of storing enormous amounts of information at low cost.

3. In order to ensure the utmost reliability for telephone switching systems, an engineer prepares elaborate equipment designed to detect and measure friction on switch contacts.



# Switching



1. In a matter of minutes, computerized testing ensures that each of the thousands of components and connections in a crossbar switching system is functioning perfectly.
2. The effects of inflation were reduced by employee-contributed cost reductions. Stamped metal rack for plug-in modules replaces more costly metal castings.
3. New manufacturing processes, such as this sequential press for MINIBAR\* crossbar contacts, increased the manufacturing capacity of the Division, as well as the quality and reliability of the products.

The Switching Division participated in intensive development of electro-mechanical and electronic stored program switching systems.

Installation and testing of the Vancouver 4A-ETS toll switching system for the British Columbia Telephone Company began during 1970 and will be completed in 1971. Designed to handle the growing volume of toll traffic in Western Canada, this is the first Canadian application of stored program control to the routing of long distance traffic.

The SP-1 electronic switching system demonstrated its capability to provide many of the service features required by operating companies in the future. Installation of the first commercial office at Aylmer, Quebec, began in 1970. The office will be in operation in 1971.

The Switching Division manufactures crossbar systems to meet domestic and international customers' requirements ranging from small community dial offices to large metropolitan exchanges with such modern features as DIGITONE\*, Centrex, and Automatic-Message Accounting.

The continuing ability of crossbar systems to meet changing customer requirements is evident as some

400,000 lines of crossbar switching equipment were shipped throughout the world in 1970.

In Athens, Greece, a 20,000 line crossbar exchange was placed in service with the assistance of Hellenic Telephone Organization (OTE) personnel trained in Canada and in Greece.

This is the first exchange to provide seven-digit telephone service in Greece and is the Company's largest single exchange overseas.

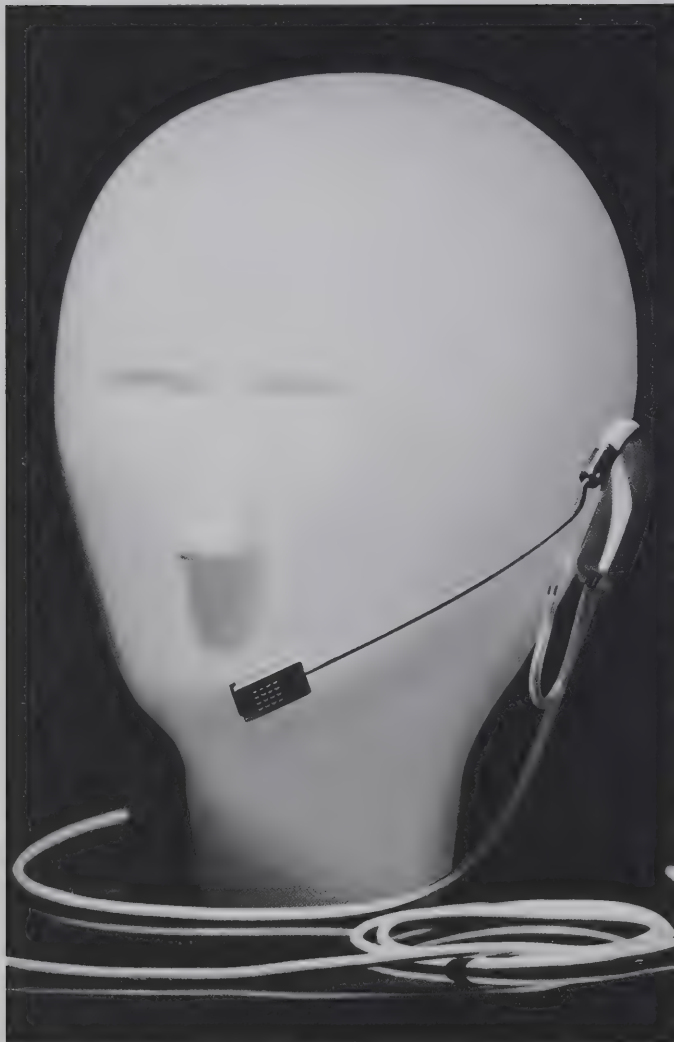
Crossbar exchanges were placed in service in the Caribbean, Europe, Africa and Asia.

Several programs were undertaken to improve quality and reliability, and to reduce costs. The increasing use of computers to perform sophisticated testing together with new manufacturing processes and technology will further improve the quality, reliability and range of switching products and services.

\*Trademarks of Northern Electric



# Apparatus



The Apparatus Division showed moderate growth resulting from sales in over twenty countries and the demand for new products such as the SE-2 common control private automatic branch exchange and the CONTEMPRA\* phone. Recent statistics show that just three months after introduction in a large Canadian metropolitan area the CONTEMPRA dial-in-handset telephone reached a market penetration of 6%.

The rate of sales growth is expected to increase with the expansion of marketing activities and the introduction of new members of the CONTEMPRA family of telephone sets, the SK-1 key telephone system, the VENTURE 1\* lightweight telephone headset, the QUIC queuing up intercom system and the single slot panel coin telephone.

Effective manufacturing cost reduction programs and the application of numerous employee suggestions assisted in maintaining product costs at competitive levels.

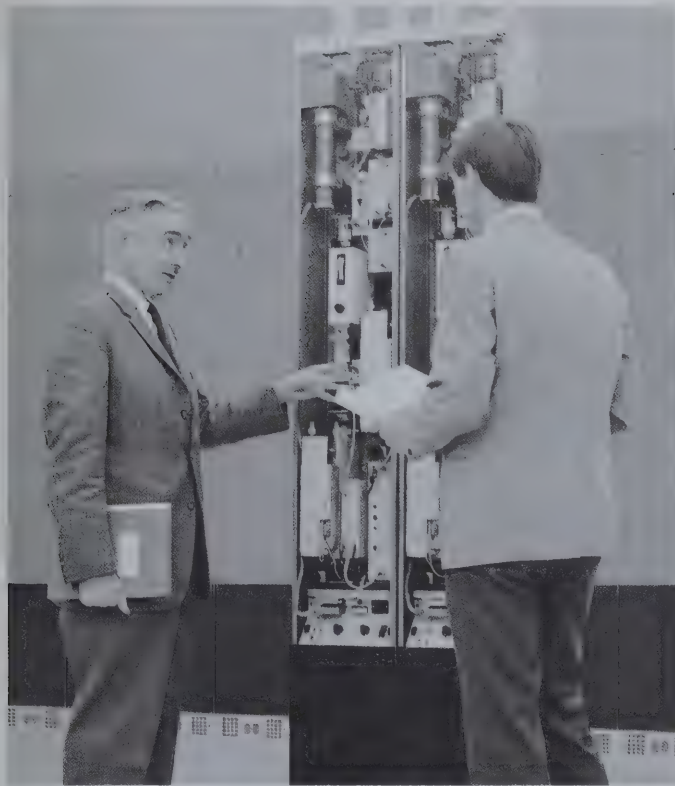
1. The new VENTURE 1 lightweight headset, developed in 1970, is the first operator's headset using an electret as the transmitter. The electret microphone, a development of the Northern Electric Laboratories, offers advantages over the carbon microphone which has been in use for more than 90 years.

2. Northern's SE-2 Private Automatic Branch Exchange (PABX), introduced in 1969, has been widely accepted by telephone operating companies due to its compactness, common-control design and range of service features.

3. Future telephone handsets, small and lightweight, will employ the latest advances in electronic telephone technology and micro-circuit development.

\* Trademarks of Northern Electric

# Transmission



1

Construction of a new transmission manufacturing centre was started in October at Lucerne, Quebec. This 150,000 square foot addition will be used to produce satellite and ground station electronic subsystems, high capacity coaxial cable carrier systems and new radio and transmission equipment now under development. The communications electronics subsystem for the Canadian Telesat satellite, ANIK, will be manufactured at this location.

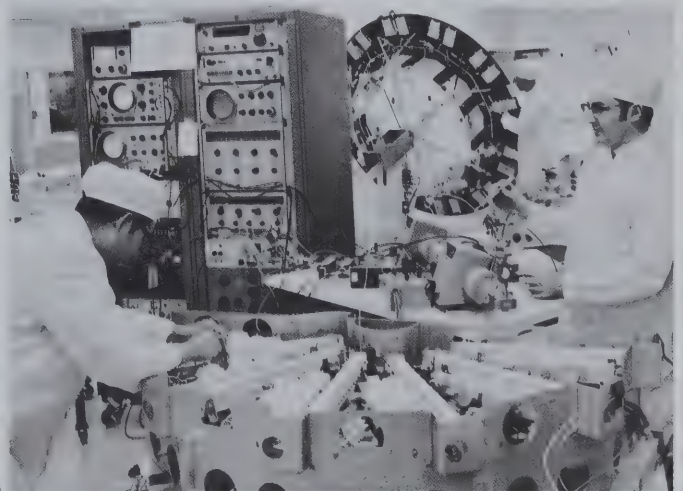
The MA-5B multiplex system, designed for use on North American long haul coaxial or radio circuits, went on field trial in December. It is expected to be in production in early 1971. The international version, MA-5A, has been sold to customers in Alaska, Chile, Turkey, U.S.A. and Canada.

In pulse code modulation (PCM) the new DE-2 channel bank with up to two systems of 96 channels mounted in an 11'6" bay, is now undergoing field trial. This PCM voice terminal is suitable for economical transmission of toll quality voice channels on digital transmission networks.

The export of transmission equipment, including microwave, multiplex and coaxial cable systems contributed significantly to the sales volume.



2



3

1. Forty-four bays of RA-2B solid-state and TWT Radio Relay equipment were successfully installed and put into operation in Chile as part of an expansion program in that country.

2. D. F. Bowie, President and General Manager of the Canadian Overseas Telecommunication Corporation, signs a contract for multiplex equipment for the COTC Satellite Earth Station at Lake Cowichan, B.C.

3. A repeater for an INTELSAT IV Satellite was assembled, tested and shipped to the British Aircraft Corporation to be integrated into the spacecraft structure under contract to Hughes Aircraft Company.



# Wire and Cable



1



2



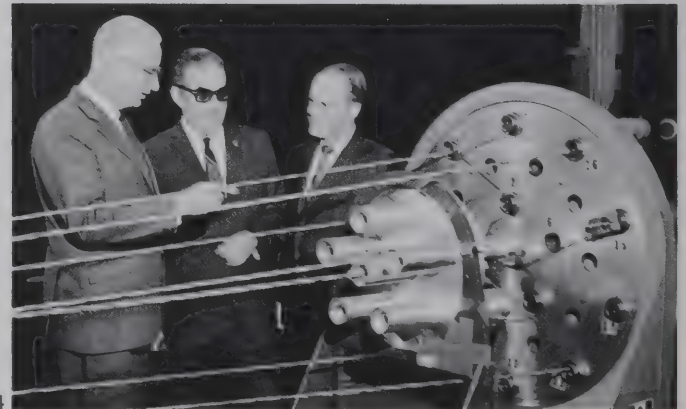
3

Wire and Cable Division sales reached a record level with significant penetration of the export market.

A new manufacturing plant is being constructed at Kingston, Ontario. The new plant with an area of 472,000 square feet will manufacture plastic insulated switchboard and telephone cable.

New machines were installed at Lachine Works in order to meet increased demands for pulp insulated and 'filled core' plastic insulated telephone cables, and coaxial cable.

Noteworthy contracts were received for the supply of 12-tube NE-174 coaxial cable systems, complete with hardware and electronic equipment. Under Company direction, a major telephone company in Western Canada achieved the first known plowing of 12-tube semi-air dielectric coaxial cable.



4

1. Installation of oil-filled pipe cable for Ontario Hydro in Ottawa.
2. Plowing of 12-tube coaxial cable for Alberta Government Telephones.
3. Completion of the new wire and cable plant on the outskirts of Kingston, Ontario, is scheduled for early 1971.
4. Lachine Production Manager, P. Gibbon, left, explains operation of new equipment to N. Tanay, Assistant Director General, Turkey PTT, and K. H. Woodley, Vice-President and General Manager, Wire and Cable Division.



# Distribution Sales



1



2

1. This new branch office is one of five opened in 1970 in the cities of Rimouski, P.Q., Quebec City, P.Q., Mississauga, Ont., Oshawa, Ont., and Kitimat, B.C.

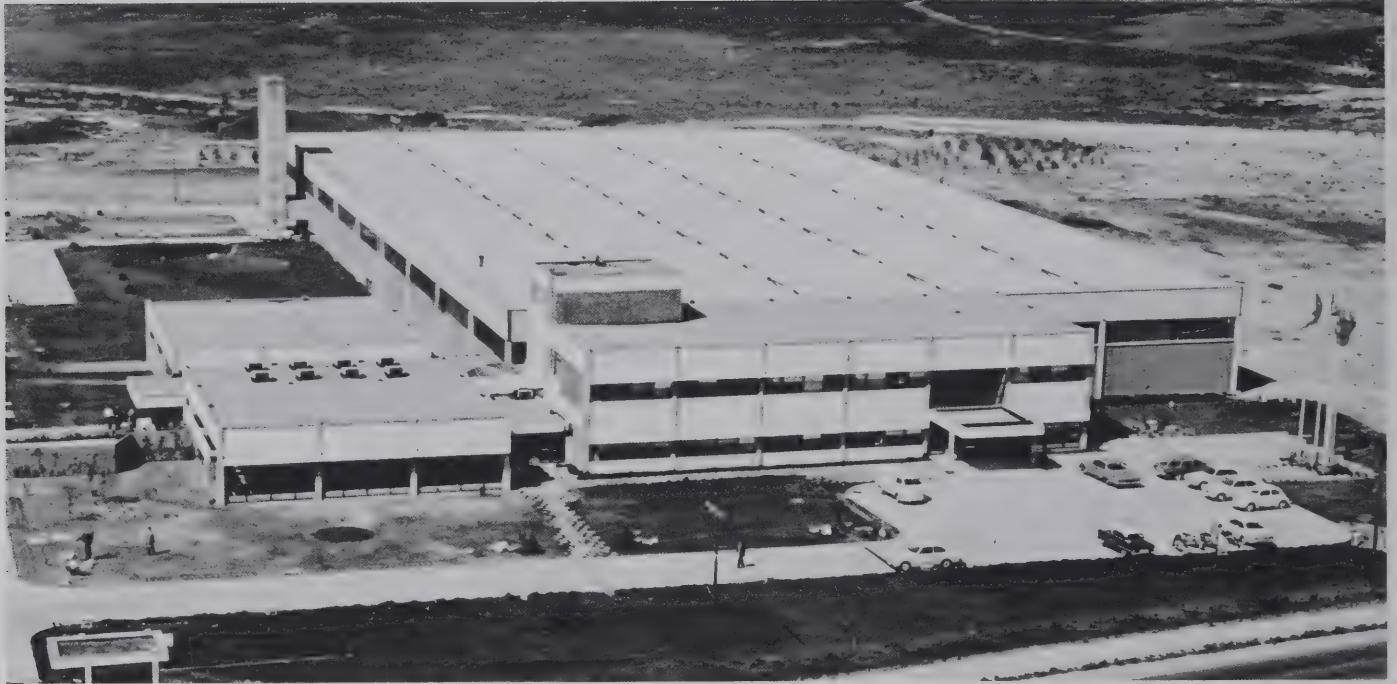
2. Modern warehouses and sales offices provide a complete range of electrical products in 38 cities across Canada.

In accordance with a program of improving customer service, new branches with complete stocks were opened in Rimouski, Quebec City, Mississauga, Oshawa and Kitimat. Facilities were enlarged at three other locations.

The introduction of a new inventory control system, coupled with a major increase in branch stocks, ensures meeting customer requirements.

Engineering and technical assistance to customers on a wide range of new complex products was increased during the year.

# Turkish Operations



The Turkish subsidiary, Northern Electric Telekomünikasyon A.Ş., progressed steadily with a major increase in the production of switching equipment, the manufacturing start-up of telephone exchange switchboards and power equipment, and the export of dial telephones to Lebanon.

In cooperation with The Post Telegraph and Telephone Administration of the Republic of Turkey, a new transistorized magneto telephone set was developed. Production commenced in mid-year. The present production rate for the new product will be doubled in 1971 as a result of market demand.

The staff, many of whom received some training in Canada, have reached a relatively high level of efficiency in the two years the plant has been in operation.



1. The Turkish plant employs over 750, produces switchboards, switching equipment and telephone sets, and provides installation services throughout Turkey.

2. Production of telephone switching equipment at the Turkish subsidiary tripled during 1970.

# Purchasing

Purchases from suppliers during the year exceeded \$150,000,000. These purchases were made from more than 4500 suppliers of which 82% are companies across Canada employing less than 500 people. Of the Company's purchasing dollar, 87 cents was spent in Canada.

The rapid technological change in the communications industry brought a need for many items which had not been produced in Canada. The purchasing people established many sources in Canada for these new products which stimulated and expanded the technological capability of these suppliers.

The continuing search for competitive sources of supply and the programming of our requirements in more economical quantities resulted in substantial savings.

# Environmental Control

The systems and devices installed in all plants for the control of air, water and soil pollution are under continuous study. A committee of chemical engineers representing the various manufacturing locations meets regularly to review the effectiveness of systems and to update them in the light of new technology.

A program is underway to bring waste emission in older plants to levels which will meet current air and water pollution regulations.

Fuel oils with low sulphur-dioxide values are used at all plants and emissions into the atmosphere are well below levels permitted. As fuels with lower sulphur-dioxide content become available these will be used.

The coal-burning boiler at the Belleville plant was replaced last summer by a gas-fired unit.



# Northern Electric Company, Limited

## Products manufactured

### Telephone Switching Systems

Electro-mechanical exchanges  
Electronic exchanges  
Long distance exchanges and switchboards  
Private automatic branch exchanges (PABX)

### Transmission Systems

Microwave radio  
Satellite ground stations  
Satellite electronics  
Parametric amplifiers  
Carrier multiplex and telegraph systems

### Telephone Sets

Residential telephone sets  
Public telephone sets  
Business telephone sets  
Key telephone sets and systems  
Business interphones

### Wires and Cables

Telecommunications wire and cables  
Power wire and cables

### Telecommunications Power Plants

24V, 48V and 130V power plants  
Ringing and tone plants

### Telecommunications Apparatus

A complete line of apparatus and components

### Manufacturing Centres

Halifax, Nova Scotia  
Saint John, New Brunswick  
Montreal, Quebec  
Montreal North, Quebec  
Town of Mount Royal, Quebec  
St. Laurent, Quebec  
Lachine, Quebec  
Lucerne, Quebec  
Kanata, Ontario  
Belleville, Ontario  
Kingston, Ontario  
Bramalea, Ontario  
Toronto, Ontario  
London, Ontario  
Winnipeg, Manitoba  
Regina, Saskatchewan  
Calgary, Alberta

### Subsidiary Companies

Bell Canada-Northern Electric Research Ltd.  
Ottawa, Canada

#### Main Laboratories

Ottawa, Ontario

#### Regional Laboratories

Montreal, Quebec  
Lachine, Quebec  
Ottawa, Ontario  
Belleville, Ontario  
Bramalea, Ontario  
London, Ontario

Microsystems International Ltd.  
Montreal, Canada

Dominion Sound Equipments Limited  
Montreal, Canada

Northern Electric Telekomünikasyon A.Ş.  
Umraniye (Istanbul), Republic of Turkey

Industrial Corporation for Telecommunications Equipment S.A.  
Northern Electric Hellas, Athens, Greece

Northern Electric Caribbean Limited  
Jamaica, W.I.

### Associated Company

Ancom Systems Limited  
Ottawa, Canada

### Sales Offices and Warehouses

St. John's, Newfoundland  
Halifax, Nova Scotia  
Saint John, New Brunswick  
Moncton, New Brunswick  
Chicoutimi, Quebec  
St. Foy, Quebec  
Trois-Rivières, Quebec  
Sherbrooke, Quebec  
Montreal North, Quebec  
Montreal, Quebec  
Rimouski, Quebec  
Ottawa, Ontario  
Kingston, Ontario  
Toronto, Ontario  
Hamilton, Ontario  
Kitchener, Ontario  
St. Catharines, Ontario  
London, Ontario  
Sarnia, Ontario  
Windsor, Ontario  
Kirkland Lake, Ontario  
Sudbury, Ontario  
Sault Ste. Marie, Ontario  
Thunder Bay, Ontario  
Mississauga, Ontario  
Oshawa, Ontario  
Winnipeg, Manitoba  
Regina, Saskatchewan  
Saskatoon, Saskatchewan  
Edmonton, Alberta  
Calgary, Alberta  
Vernon, British Columbia  
Dawson Creek, British Columbia  
Prince George, British Columbia  
Kamloops, British Columbia  
Kitimat, British Columbia  
Vancouver, British Columbia  
Victoria, British Columbia

### Represented in over 50 countries



# Northern Electric Company, Limited

## Annual Report 1970

### Glossary of Terms

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#### **Apparatus**

The communications products which are found on customer premises rather than in telephone buildings.

#### **Automatic Message Accounting**

A feature of modern telephone switching systems which *automatically* records the information required for billing long-distance calls.

#### **Centrex**

As well as other features, Centrex service allows the telephone subscriber to dial directly into PBX extensions without going through the PBX operator.

#### **Channel Bank**

The first stage of combining telephone conversations in multiplex terminals. Typically combines 12 voice channels into one composite signal which is further combined with other composite signals so that many conversations may be transmitted over a single line.

#### **Coaxial Cable**

A coaxial pair of conductors consists of one conductor in the form of a tube and the second conductor in the form of a wire running down the centre of this tube. A coaxial cable is the combining of several such coaxial pairs under one sheath.

#### **Coaxial Cable Carriers System**

A system of coaxial cables and multiplex used for transmission of high traffic volumes of voice, data and video signals over long distances. Preferred in metropolitan areas because it is an underground system, eliminating the need for microwave towers.

#### **Common Control Private Automatic Branch Exchange**

A small switching system installed on a customer's premises which provides on-site telephone switching as well as outside connections. Common control is a technique

which provides for flexibility of expansion and the addition of other features in switching machines in communications networks.

#### **Crossbar System**

A switching system using a particular kind of mechanical switch called a crossbar switch. Crossbar switching systems concentrate control of most of their action in a central part of the machine rather than diffusing control throughout.

#### **Data Terminal**

Equipment capable of sending and receiving data in the form of electrical signals so that one may converse with a computer or another data terminal.

#### **Digital Transmission System**

A transmission system which uses the technique of sending information in the form of pulses. Pulse code modulation is one such technique.

#### **Digitone\* Telephone Set**

A pushbutton telephone set by which the telephone number or other data is sent forward to the network by depressing buttons instead of turning a rotary dial.

\*Trademark of Northern Electric Co. Ltd.

#### **Electret Transducer**

A device developed by Northern Electric which provides a simple method of converting sound into electricity; based on a principle discovered in 1919.

#### **Electronic Switching System**

Switching systems are still electro-mechanical in design in the sense that connections are made by magnets moving pieces of metal together.

The most important feature of current electronic switching is the controlling of the switching system by instructions and logic contained in computer-like memories and re-

called as required during the operation of the switching system. This is "stored program control".

#### **Four-Wire Toll Switching Systems**

Systems within communications networks which provide connection between computer and data terminals and telephones by direct-distance dialing. Four-wire transmission gives better quality by separating the two directions of communication.

#### **Frequency-Division Multiplex**

A method of arranging the many voice frequency circuits, before inserting them onto a carrying medium, is to stack them up in frequency.

#### **Integrated Circuit**

The term integrated circuit is essentially synonymous with microcircuit.

#### **Key Telephone System**

A system using a telephone set on which more than one line terminates and allows the answering and use of more than one line of the telephone set.

#### **Light-Emitting Diodes**

Miniature semiconductor devices which emit light when energized by an applied voltage. Light-emitting diodes consume far less power, last much longer, and are more reliable than miniature incandescent lamps.

#### **Magnetic Bubbles**

Minute cylindrical regions of magnetization present in single-crystal sheets of magnetic oxides which are capable of storing enormous amounts of information.

#### **Microcircuits**

Microcircuits contain dozens, and in some cases hundreds, of active semiconductor devices (transistors, diodes) and passive devices (resistors, capacitors) on one piece of pure silicon a few hundredths of an inch square.



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**Microwave Radio Transmission**

The propagation of radio energy at extremely high frequencies (a few billion cycles per second) which transmits information from one point to another.

**Multiplex**

The equipment used to group voice circuits on a microwave system or other transmission medium.

**Oil-Filled Pipe Cable**

A system consisting of insulated electrical conductors inside a protective steel pipe which is filled with oil under pressure. Used for transmission and distribution of large blocks of electrical power.

**Pulse Code Modulation (PCM)**

A technique for combining many signals into one channel for transmission; can combine voice, data, and video signals with excellent quality. Permits transmission over longer distances with less background noise at lower cost.

**Queuing-Up Intercom**

An intercom system designed for use in airline reservation offices which permits calls to be held and answered in the order in which they are received.

**Semiconductor**

A semiconductor is a material which is neither a good conductor of electrical current nor an insulator. De-

vices (transistors, diodes) using these materials have replaced vacuum tubes. Semiconductors improve reliability and are much smaller and less costly.

**Solid-State Crosspoints**

Tiny devices made of semiconducting material which will perform the switching function in future switching systems.

**Transmission**

In a communications system, transmission refers to the transmission of information from one geographic location to another.

**Travelling-Wave Tube**

An efficient, high-powered radio-frequency amplifying device used in microwave radio transmitters.

**Visual Terminal**

Equipment capable of producing visual images from computer output which may be received via telephone lines; also provides data input to a computer.





